Chapter 27

Critical Ethnography in the VMT Project

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Abstract: The approach of the VMT Project has usually been described as design-based research in the learning sciences. However, it can also be understood as ethnography, using a micro-ethnographic style of interaction analysis to study the construction of social order in the exotic culture of virtual math teams. This chapter reviews the history of critical ethnography (CE) to describe the orientation and concerns of a stream of social science theorizing that seems particularly relevant to the work of the VMT research team. CE adopted the ideas of critical social theory and philosophy from Kant to Habermas. It passed through two distinct generations of thought. After reviewing this history, the chapter focuses on three key phenomena that are characteristic of CE analysis: temporalizing, objectification and intersubjectivity. It then suggests that these phenomena are also significant within the VMT analysis (e.g., Chapters 6, 7, 8), where they receive detailed analysis of empirical data. The VMT Project can be seen as a productive extension of CE work in a contemporary social setting.

Keywords: Critical ethnography, critical social theory, critical philosophy, intersubjectivity, temporality, objectification

Although "ethnographic" research is frequently cited or conducted in CSCL, there is little consensus in this literature about what distinguishes ethnographic analysis from other forms of research. While the term ethnography can be used in a methodological sense to designate any form of unstructured observation, a survey of recent anthropological ethnography reveals profound transformations that challenge classic conceptions of ethnographic practice. The social constructionist tradition of "critical ethnography" (CE) is particularly relevant for CSCL practitioners because

of its critique of scientism and concomitant focus on intersubjectivity. Within CSCL and more generally in the learning sciences, scientistic assumptions that fundamental aspects of reality and ideas are given rather than developed by human and social activities has been thoroughly critiqued by constructivism. Specifically, the emphasis on intersubjectivity as a foundation for the nature of the social world is by definition relevant to CSCL, concerned with collaboration and collaborative learning.

This chapter aims to describe a form of ethnography that corresponds in many ways with the work of the VMT Project. This form has come to be known as *critical ethnography*. CE grew out of critical social theory as developed in the Frankfurt school of social research, including Horkheimer, Adorno, Marcuse and Habermas. The chapter will briefly review the development of CE through two distinct generations of thought that were enunciated before and after 1986, respectively. It will then look more closely at the CE analysis of three social phenomena. These phenomena have also been analyzed in the VMT Project.

The VMT Project—through its fine-grained analyses and emphasis on issues such as temporality, objectification and intersubjectivity—not only embodies many of the tenets of CE, but can be seen as an effort to adopt and advance the CE research agenda.

Exemplary Ethnography

It is difficult to formulate a helpful description of CE or even of ethnography in a sentence of two. It may be useful to first become familiar with a prototypical example. Forsythe's book (2001), *Studying Those Who Study Us: An Anthropologist in the World of Artificial Intelligence*, provides an excellent introduction to the concerns and challenges of critical ethnography.

Of particular interest is her account of a project to build a natural-language patient-education system for migraine sufferers, which would elicit a patient's symptoms and medical history and use that information to present individually tailored information about diagnosis and treatment. Her fieldwork included observation of visits in neurology, interviews with physicians and patients, and extended formal interviews with migraine sufferers. Forsythe was simultaneously conducting ethnographic analysis *of* and *for* the design project. However, as the project progressed she found it increasingly difficult to reconcile the roles of participant and observer because of the epistemological and practical tensions between the "relativist understandings of ethnographic data" and "the positivist expectations and procedures of normal system building." Despite compilation of a rich body of ethnographic data about migraines and a shared intention to incorporate anthropological insights into an innovative system design, the resulting software prototype "reflected much less ethnographic input than we had originally envisioned" (p. 98).

Forsythe demonstrates how the software designers' cultural and disciplinary assumptions were embedded in every stage of development. Rather than await compilation of ethnographic research, developers performed their own knowledge

acquisition, interviewing a single neurologist about issues like treatment strategies and the use and side effects of different migraine drugs. The neurologist also provided a model dialog of a typical doctor-patient encounter, wherein both participants speak in unambiguous declarative sentences and the distinction between questions and answers is quite clear. The model dialog also assumed that all communication is verbal and context-independent. However, Forsythe found that patients' speech was often rambling and repetitive and unintelligible in the absence of nonverbal and contextual cues (pp. 154-55). When the time came to "add in" the results of the ethnographic analysis, fundamental contradictions were revealed. The perspective of the neurologist, which privileged the knowledge and categories of formal medicine, was incorporated into the basic design of the system. This perspective conflicted with the ethnographic findings, which saw the patients' and the physicians' perspectives as being different, but equally valid (pp. 105-107).

Forsythe's work provides an excellent example of the potentially holistic nature of ethnographic research. Her reflexive awareness of positionality eschews any pretensions of impartiality and neutrality; rather, she argues for a stance of epistemological awareness. Because she observes people whose status and power are generally greater than her own, Forsythe's work also exemplifies what Nader (1972) calls "studying up," the antithesis of traditional colonialist anthropology. Instead of "going native" to elicit and uncritically reproduce the perspectives of her informants (be they migraine sufferers or neurologists), she believes the ethnographer's method should be a continual "stepping in and stepping out" of the field situation (2001, pp. 71-72). Ethnography is predicated on the creative tension inherent in the oxymoron "participant observation." The researcher must balance the cultural immersion required for meaningful participation with the critical distance required for observation and analysis.

Yet, Forsythe also demonstrates how difficult it is to incorporate foundational, critical ethnographic insights into system designs, particularly when there are substantial, often unrecognized, epistemological differences between the worldviews of system designers and social scientists. Bader & Nyce offer a comparably pessimistic assessment: "The difficulty is that knowledge about the social construction of reality is not the kind of knowledge the development community values, can do much with, or seems to be much interested in" (1998, p. 6). They conclude: "There is, we believe, a demonstrable, fundamental gap between the knowledge the development community values and that which cultural analysis yields. Much of what goes on in social life developers and programmers simply do not see as having any relevance for their work" (p. 10).

However, as a field of inquiry explicitly concerned with the collaborative social construction of knowledge, CSCL has an obligation to seize the opportunity the larger software development community has thus far eschewed. The VMT Project has embraced this opportunity, addressing many of the concerns raised by Forsythe's analysis.

Classic and Critical Ethnography

This section will discuss how fundamental elements of critical ethnography are grounded in the continental critical theory tradition and, in turn, are embodied in the VMT Project. First, a brief (and highly selective) overview of contemporary ethnography will demonstrate both the wide variety of current research approaches and the extent to which CE concerns have been incorporated into mainstream theory and practice in anthropology and cognate disciplines.

In a chapter entitled "Erosion of Classic Norms," Rosaldo critiques the "classic period" of ethnography which he dates to the period 1921-1971 (1993, pp. 25-45). Classic period ethnographers, especially in Great Britain, typically worked within the French sociological tradition of Durkheim, where culture and society were analyzed as objective systems that "determined individual personalities and consciousness." Not surprisingly, the classic mode of analysis was predicated upon "a detached observer using a neutral language to study a unified world of brute facts" (Rosaldo, 1993, pp. xviii, 32). The inherent positivism of classic ethnography also presupposed a series of inviolate Cartesian dichotomies such as fact/value, subject/object, mind/body, individual/society and self/other.

According to Rosaldo, a range of social, political and intellectual transformations have transformed classic modes of ethnographic analysis since the late 1960s, "leaving the field of anthropology in a creative crisis of reorientation and renewal" (1993, p. 28). Some of these issues will be examined in greater detail below, but for the moment Table 27-1—selectively compiled from a wide variety of sources—presents an overview of some of the major issues addressed by CE.

Table 27-1. Schematic comparison of classic and critical ethnography.

Classic Ethnography	Critical Ethnography
Positivist, scientistic method	Reflexive, critical (Clifford & Marcus, 1986; Marcus, 1999b; Scholte, 1972)
Exotic, bounded field site	Studying at home, studying up (Nader, 1972), multi-sited research (Marcus, 1995), cyberspace (Hakken, 1999; 2003; Teli, Pisanu & Hakken, 2007)
Cartesian dichotomies	Embodied knowledge, unity of consciousness and activity (Kaptelinin & Nardi, 2006)
Interrogation, extraction	Dialog, collaboration (Tedlock, 1986)
Neutrality, detachment	Political engagement (Smith, 1999), circumstantial activism (Marcus, 1999a)
Elicitation, analysis of un-interpreted facts	Everyone's an analyst (Garfinkel, 1967; 2002)
Common sense as resource	Commonsense as topic (Forsythe, 1999; 2001)
Fact/value dichotomy	Unity of theory and practice (Lave, 1991)
Objective reality is "out there"	Social construction of reality (Hacking, 1999)
Context as container	Context as construct (Nardi, 1996)
Disembodied scientific objectivity	Feminist objectivity, situated action and knowledge (Haraway, 1991; Nader, 1996; Suchman, 2007)
Participant observation	Observation of participation (Nader, 1996; Tedlock, 1991)

Several of these transformations are particularly relevant to the fields of ethnomethodology (EM) and conversation analysis (CA). For example, Button critiques the shortcomings of "classical ethnography," making a distinction between "scenic" fieldwork "that merely describes and codifies what relevant persons do in the workplace" and ethnography that explicates "members' knowledge—what people have to know to do work, and how that knowledge is deployed in the ordering and organization of work" (Button, 2000, p. 319). Similarly, Goodwin & Heritage demonstrate how "CA transcends the traditional disciplinary boundaries of social anthropology by providing a perspective within which language, culture, and social organization can be analyzed not as separate subfields but as integrated elements of coherent courses of action" (1990, p. 301). Finally, classic ethnography's aspiration to "holism" dictated a preference for isolated, bounded field sites where all aspects of a culture (e.g., ritual, subsistence, kinship) could be analyzed. In CE, this is supplanted by a "truly holistic framework . . . that captures the interactional and discursive constitution of human relations and social organization" regardless of context (Streeck & Mehus, 2005, p. 399).

Critical Theory: From Kant to Habermas

Much of the research in CSCL can be situated within a social-constructivist tradition grounded in continental critical theory. This tradition rejects the empiricist assumption of objective, pre-existing facts and can be characterized by three basic theses:

> (1) The *ontological* thesis that what appears to be 'natural' is in reality an effect of social processes and practices; (2) the *epistemological* thesis that knowledge of social phenomena is itself socially produced; and (3) the *methodological* thesis that the investigation of the social construction of reality must take priority over all other methodic procedures. (Sandywell, 2008, p. 96, emphasis added)

Both critical ethnography and the theory of group cognition explicitly draw upon the history of critical philosophy, as illustrated in Figure 14-1 of (Stahl, 2006, p. 289). The term "critical" first arose in Kant's *Critique of Pure Reason*, where it signified the drawing of the limits of the topic under study. Synthesizing the previously prevailing philosophies of rationalism and empiricism, Kant undertook a "Copernican revolution," arguing that the world is not "given" to us as objective empirical data, but is constituted as causally connected and arrayed in space and time thanks to our minds, which constitute it as so ordered (Kant, 1787/1999). Hegel's critical dialectics radically extended the argument to show how mind itself has developed historically and culturally (Hegel, 1807/1967). Dialectical thinkers since Hegel have critiqued various phenomena and disciplines by tracing their historical development. Thus, Marx demonstrated that capitalism, its products and its social relations are not fixed, universal and necessary, but are products of specific developments and can be further transformed (Marx, 1867/1976). Whereas empiricist theories of science hold that observers, data, facts, concepts, etc. are fixed

aspects of a given reality, critical theories reflect on how these entities have been constituted through social processes.

Critical social theory became an explicit topic in the writings of the Frankfurt School of Social Theory (Held, 1980). Horkheimer began by defining the approach, based on the traditions of Kant and Hegel. Adorno expanded it, applying it to cultural criticism, sociology, philosophy, music and aesthetics. Other twentieth century philosophic approaches have also adopted a critical stance toward reality. In phenomenology, Husserl conducted a thorough-going critique of psychologism and its conception of transcendental mind. Schutz (1967) situated Husserl's view in a social context, and Heidegger rejected the view of a detached mind, describing how we are active beings in a world into which we are thrown as burdened with a past, but one whose meanings are structured by our current cares and future orientations (Heidegger, 1927/1996). Even Anglo-American philosophy is largely based in Wittgenstein's (1953) critique of the view of language espoused by logical positivism. All these philosophical influences have been incorporated into the theory of group cognition.

As a student of both Horkheimer and Adorno, Habermas represents the "second generation" of the Frankfurt School, and his work—particularly *On the Logic of the Social Sciences* (Habermas, 1967/1988) and *Knowledge and Human Interests* (Habermas, 1965/1971)—provided a foundation for the development of CE during the late 1960s and early 1970s. Habermas drew "a parallel between critical theory's critique of positivism and Marx's critique of idealism" (Outhwaite, 1994, p. 26). In *Knowledge and Human Interests,* Habermas described his undertaking as "a historically oriented attempt to reconstruct the prehistory of modern positivism with the systematic intention of analyzing the connections between knowledge and human interests" (1965/1971, p. vii). Although Habermas' work can be situated within the Frankfurt School's general critique of positivism, it bears repeating that his specific interest was in reconstructing "the *prehistory* of modern positivism," in understanding positivism's conditions of possibility. He found that: "Positivism stands or falls with the principle of scientism, that is, that the meaning of knowledge is defined by what the sciences do and can thus be adequately explicated through the methodological analysis of scientific procedures" (1965/1971, p. 67).

Turning specifically to the social sciences, Habermas notes that "the concept of value freedom (or ethical neutrality)" is reflected in an epistemological "severance of knowledge from interest." This dichotomy "is represented in logic by the distinction between descriptive and prescriptive statements, which makes grammatically obligatory the filtering out of merely emotive from cognitive contents" (1965/1971, p. 303). The "illusion of objectivism," the belief in "a self-subsistent world of facts structured in a law-like manner," provides the basis for the "restricted, scientistic consciousness of the sciences" which can only be challenged "by demonstrating what it conceals: the connection between knowledge and interest" (1965/1971, pp. 69, 316). However, positivism has so effectively repressed older philosophical traditions and permeated the self-understanding of the sciences that

> the illusion of objectivism can no longer be dispelled by a return to Kant but only immanently—by forcing methodology to carry out a process of self-reflection in

terms of its own problems. . . . It can no longer be effectively overcome from without, from the position of a repurified epistemology, but only by a methodology that transcends its own boundaries (1965/1971, p. 69).

In other words, the pervasive influence of positivism can no longer be directly challenged through philosophical critique, but only through actual disciplinary *praxis* (practice) that "transcends its own boundaries." This is the challenge taken up by early critical ethnographers, and is reflected today in the transformative research of the VMT Project.

Critical Ethnography

Because the term "critical ethnography" is currently used in a wide variety of theoretical and disciplinary settings, it is difficult to provide a concise, encompassing definition. Instead, we will take an historical approach, examining CE's origins in continental critical theory and highlighting elements of particular relevance for CSCL practitioners. In subsequent sections, we will show how elements of CE are embodied in the VMT Project and discuss how VMT advances the CE research agenda.

We can speak of two "generations," of CE, the first initiated by the publication of *Reinventing Anthropology* (Hymes, 1972) and the second by the publication of *Writing Culture: The Poetics and Politics of Ethnography* (Clifford & Marcus, 1986), although, as we shall see, a few scholars have remained consistently influential through both generations. This generational distinction is essential because the seminal early works have been overlain by, and incorporated into a subsequent generation of "critical" ethnographic perspectives that are grounded in a variety of disciplinary perspectives, particularly post-modernist literary criticism. Although these second-generation perspectives built upon, or emerged in opposition to, the foundational works, the "presentist" orientation of the recent scholarship obscures these connections and the aspects of CE of greatest potential relevance to CSCL are not readily accessible (Bunzl, 2005, p. 192).

The First Generation (c. 1968-1986)

An important precondition for the emergence of CE was the contestation of the meaning of "ethnography." Fabian (1990b) notes an implicit method/theory dichotomy within the anthropological tradition in the distinction between *ethnography* (literally "description of peoples"), and *ethnology* as a comparative, theoretical, synthesizing enterprise. By the late 1950s the dichotomy between ethnography (which had become synonymous with empirical research and data collection) and theory was being challenged by a generation of "new ethnography" practitioners. According to Fabian, "the old opposition between theory and ethnography was abolished and ethnography itself was declared a theoretical enterprise" (1990b, p. 760).

In "History, Language and Anthropology"—certainly one of CE's foundational documents—Fabian discusses the shortcomings of "scientistic social research" revealed by his empirical research on Jamaa, a charismatic religious movement in the Congo (1971; reprinted in Fabian, 1991b). In a later monograph he reflected:

> The phenomena I was interested in offered little in the way of outwardly observable behavior, of traits that could be mapped or counted, in short, of the kind of "hard data" that, properly collected, classified, and analyzed, are said to produce ethnographic knowledge. Probably, working with an illusive religious movement that refused to be approached in any other way but talk, in and on their own terms, was decisive in shaping my convictions. (Fabian, 1990b, p. 4)

Fabian's dissatisfaction with the limitations of his "Weberian-Parsonian" doctoral training at the University of Chicago and his anxieties arising from a "failure to find the sort of hard social 'facts' which my training in 'scientific' sociology had let me to expect," forced him to explore more dialectical analytical approaches (1971, p. 23; 1991a, p. 183). Realizing that the "positivist-pragmatist approach" is intellectually mired "in the period of pre-Kantian metaphysics," he turned to the work of Marx, Habermas and the linguists von Humboldt and Hymes. However, he also realized that the quandaries he was facing could not be resolved through philosophical or theoretical discourse alone, but only through anthropological praxis. In explaining the motivation for his publication, Fabian noted that it was Habermas who

> pointed out that it would be unrealistic to cite social science before the court of Kant's critique of reason; a reform must come from within, from, as I understand him, a confrontation with the epistemological problems of today's social research. To attempt, or at least to approximate, such radical critique from within is the intention of this paper. (Fabian, 1971, p. 21)

In his struggle to develop a non-positivist theoretical approach that maintained standards of objectivity and addressed the issue of intersubjectivity, Fabian developed a language-centered approach predicated on two theses:

> (1) In anthropological investigations, objectivity lies neither in the logical consistency of a theory, nor in the giveness of data, but in the foundation (*Begründung*) of human *intersubjectivity*.

> (2) *Objectivity* in anthropological investigations is attained by entering a context of communicative interaction through the one medium which represents *and* constitutes such a context: *language*. (1971, p. 25, 27)

As we will see, the connection between objectivity and intersubjectivity was to become a continuing theme of Fabian's research.

In language that resonated with contemporaneous work in ethnomethodology, Fabian noted that, for the positivist social scientist, social facts consist of observed regularities reveling a "reality behind" the observed data. Citing Hegel and Marx, Fabian proposed a radical counter proposition, "that the particulars of observation are not just contingent indicators of an underlying necessary reality. They are not seen as 'cases of' but as *results of a process* in which a totality realizes itself" (Fabian, 1971, p. 26).

Scholte, in his contribution to *Reinventing Anthropology* (Scholte, 1972) and elsewhere, offered a similar critique. Again citing Habermas, he wrote that "scientism . . . is finally and radically being challenged on political, normative, philosophical, and even anthropological grounds" and he thus advocated creation of "a reflective, critical, and emancipatory anthropology" (1971, p. 781). "Critical anthropology," according to Scholte, "seeks to transcend the naïve dualism of subject and object . . . The communicative and constitutive relation between self and other is considered the absolute foundation of anthropological praxis" (1978a).

The only way "scientism" could overcome its inherent limitations would be "to embark on a self-reflexive and self-critical course, that is, one which would emancipate it from its own paradigmatic stance." However, such a course is precluded by "the widely held assumption that there is, and should be, a discontinuity between experience and reality, between the investigator and the object investigated" (Scholte, 1972, p. 435). Taking an explicitly anthropological perspective, he also wrote that scientism is "ethnocentric in presuming that the canons of scientific reason and technical application are objective and universal. In fact, they are neither" (Scholte, 1978b, p. 178). In a move that presaged future developments in ethnomethodology, Scholte also suggested that Garfinkel's "claims for action may be applicable to scientific activity as well," that a paradigm's sense of its own facticity, objectivity, accountability, and communality, "is to be treated as a contingent accomplishment of socially organized common practices. In short, they are not given, but accomplished" (citing Garfinkel, 1972, p. 323; Scholte, 1978a, pp. 8-9).

Finally, we should note Nader's essay, *Up the Anthropologist—Perspectives Gained From Studying Up* (1972). Nader suggested that traditional ethnographic research depended upon power relations that favored the anthropologist and she exhorted anthropologists to "study up," to explore situations where they are *less* powerful than the people or institutions being analyzed: "What if, in reinventing anthropology, anthropologists were to study the colonizers rather than the colonized, the culture of power rather than the culture of the powerless, the culture of affluence rather than the culture of poverty?" (1972, p. 289). She also challenged the "mystique about participant observation," noting that this form of research had unexamined theoretical consequences and "weighed heavily in the decisions as to where anthropologists study: we prefer residential situations, whether the residence is in a primitive village or a modern hospital" (1972, p. 306). Nader's work prodded anthropology toward transcendence of its colonialist origins and opened a space where non-traditional research methods and venues could be considered valid ethnographic research, ranging from "microethnography" (Streeck & Mehus, 2005) through "multi-sited" and "world systems" ethnography (Marcus, 1995). The anthropology of education (Hamann, 2003) and cyberspace (Hakken, 1999; 2003; Teli et al., 2007) owe her particular debts of gratitude.

Writing two decades after the publication of *Language, History and Anthropology*, Fabian was hesitant to revisit the early critique of positivism and scientism. However, he insisted that "moral perplexities," "political impasses" and "paradoxes regarding the nature of anthropological knowledge" should still be

examined in epistemological terms (Fabian, 1991b, p. 190). Fabian's admonition notwithstanding, an understanding of these early critiques enhances our understanding of the divergent strands of second generation CE. According to Roscoe, "modern critical anthropology" went awry "in failing to follow a lead laid down by its radical forbearers," particularly Scholte, in their careful distinction between "science" and "scientism." In collapsing science into positivism, "the scientistically inclined have trapped incautious critics into accepting at face value their claim that the positivist program is science." However, the objective of the first-generation critical anthropologists "was not to reject a science of society but to place it within a humane rather than a scientistic framework" (Roscoe, 1995, p. 501). The spirit of first generation CE is preserved and nourished by the continuing publication of the journals *Dialectical Anthropology* and *Critique of Anthropology*, both founded in 1975.

The Second Generation (c. 1986-present)

The onset of second generation CE can be defined by the publication of *Writing Culture* (Clifford & Marcus, 1986). Co-edited by a non-anthropologist (Clifford), the volume was self-consciously "post-disciplinary" in its shift away from "anthropology" *per se* toward conceptions of "ethnography" and "culture" that were situated within larger debates in Cultural Studies. However, according to Bunzel, the innovative and transformative character of *Writing Culture* should not be overstated:

> Having incorporated the epistemological, political, and textual reorientations engendered by the crisis of anthropology, the volume thus stood at the beginning of anthropology's transdisciplinary turn—a turn that reinvented the discipline through the deliberate erasure of what had come to be seen as its compromised history. (2005, p. 192)

In addition to analyzing ethnography as a method of social science research, the "literary turn" (Evans, 2007; Handelman, 1994) initiated by *Writing Culture* also fostered examination of "ethnography" as a genre of social science text as well as experimentation with non-realist literary forms of ethnographic writing. Fabian acknowledges that the focus on ethnographic authority prompted by the "postmodern turn" provides a "much more sophisticated view of the literary means in the production of ethnographic knowledge [adding] another dimension to the critique of anthropology." However, he argues that some "recent celebrations of the anthropological muse" have confused *diagnosis* (of anthropology being constituted as a literary practice) with *therapy* (the claim that literature will save anthropology)," concluding, "seeking oblivion in the embraces of literary theory or philosophy of science cannot be the way to go for critical anthropology" (1991a, pp. 92, 94, emphasis added).

The expansive conception of ethnography exemplified by *Writing Culture* is also celebrated by Rosaldo, who argues that "ethnography has been cultural anthropology's most significant contribution to knowledge," representing "an emergent interdisciplinary phenomenon" (1993, pp. 38-39). Although the unmooring of ethnography from anthropology has fostered creative, and often critical,

ethnographic research in a wide variety of disciplines and settings, there are potential perils. The decontextualization of ethnography, coupled with the historical "erasure" represented by second generation CE, means that well-intentioned attempts to infuse ethnography with critical perspectives are often conducted in isolation from historical and contemporary debates within anthropology, debates about what Fabian calls "the very 'conditions of possibility' of producing ethnographic knowledge in communicative, interactive, and dialogical rather than positivistic ways" (Fabian, 1991a, p. 187). Elsewhere, Fabian optimistically reflected on the influence of *Writing Culture* and similar second generation CE works: "The critique of misplaced scientism in anthropology has been a good thing, a hard-fought victory over a collusion of theories of knowledge, conventions of representation, and the practice of Western imperialism." Now that "interpretative and hermeneutic approaches" had demonstrated "viable alternatives to positivism," Fabian felt it was time to take "critical anthropology" to "a new level" (1990b, p. xiii).

Fabian's innovative monograph *Power and Performance: Ethnographic Explorations Through Proverbial Wisdom and Theater in Shaba (1990a)* exemplifies his own attempts to incorporate insights from the "literary turn" in ethnographic writing and take critical anthropology to a "new level." The ethnography was born in Zaire when Fabian heard a local proverb, spoken only in French, "*Le pouvoir se mange entire*" ("power is eaten whole"). Consultation with friends and colleagues revealed that, while everyone seemed to know the proverb, there were no analogous proverbs in Swahili or any other local African languages. Fabian's inquiries inspired a local theater troupe to write and produce a play based upon—and named after—the proverb. The play was eventually filmed and broadcast on national television. Fabian observed and recorded every stage of the project, and his monograph includes extensive transcriptions (in both original Swahili and English translation) of various rehearsals and the final production.

Fabian makes a distinction between "informing" and "performing," stating that most "theories of ethnographic knowledge are built on models of information transfer, of transmission of (somehow preexisting) messages via signs, symbols, or codes." While these models may be descriptively useful, they are "epistemologically . . . deficient because they fail to account for historically contingent creation of information *in and through the events* in which messages are said to be transmitted" (Fabian, 1990a, p. 11). Furthermore, many realms of information cannot "simply be called up and expressed in discursive statements" by ethnographic interlocutors. "This sort of information can be represented—made present—only through action, enactment, or performance" (1990a, p. 6). A performance does not "simply enact a preexisting text. Performance *is* the text in the moment of its actualization (in a story told, in a conversation carried on, but also in a book read)." Rather than being a questioner eliciting information, Fabian suggests that the ethnographer "be a provider of occasions, a catalyst in the weakest sense, and a producer (in analogy to a theatrical producer) in the strongest." Borrowing a phrase from Turner, Fabian is suggesting that the ethnographer play the role of "ethnodramaturge" (see Turner's essay in Ruby, 1982).

Temporalizing, Objectification, Intersubjectivity in CE

Three concerns emerging from the CE tradition are of particular relevance for the VMT Project: temporalizing, objectification and intersubjectivity. This section briefly discusses these three topics in CE before turning to the corresponding VMT analyses.

Temporalizing

Anthropologists have traditionally addressed the issue of socio-cultural time through a wide variety of topics, such as "time-reckoning, calendric patterns, cultural constructions of the past, [and] time as a medium of strategy or control." In her review essay, Munn advocates a conception of "'temporalization' that views time as a symbolic process continually being produced in everyday practices" (1992, p. 116). One of the most radical and influential anthropological examinations of time is Fabian's *Time and the Other: How Anthropology Makes its Object* (published in 1983, reissued in 2002). It stands at the transition between first and second generation CE (Bunzl, 2002; Fabian, 2002) and was an important precursor to *Writing Culture* (Clifford & Marcus, 1986).

Time and the Other examines the connections between practices of temporal distancing in anthropological writing and the creation of the anthropological "Other." Fabian uses the term *coevalness* to characterize intersubjective sharing of historic time and space. According to Bunzl, "Fabian deploys the designation 'coevalness' in order to merge into one Anglicized term the German notion of '*Gleichzeitigkeit*,' a phenomenological category that denotes both contemporaneity and synchronicity/simultaneity." The skilled ethnographer establishes an intersubjective, coeval relationship with her interlocutors during the course of fieldwork. However, the conventions of classic anthropological writing, particularly the suppression of the autobiographical voice and the use of the "ethnographic present" trope, result in a "denial of coevalness," which Fabian characterizes as the *allochronism* of anthropology. Allochronism is a necessary precondition for—and an inevitable manifestation of—scientistic ethnography's belief in distanced neutrality and "objectivity" (Fabian, 2002, pp. 1-35).

Of particular relevance for the VMT Project is Fabian's analysis of *intersubjective time*, which is grounded in the phenomenological insight "that social interaction presupposes intersubjectivity, which in turn is inconceivable without assuming that the participants involved are coeval, i.e. share the same Time" (2002, p. 30). The conception of intersubjective time reflects an

> emphasis on the communicative nature of human action and interaction. As soon as culture is no longer primarily conceived as a set of rules to be enacted by individual members of distinct groups, but as the specific way in which actors create and produce beliefs, values, and other means of social life, it has to be recognized that Time is a constitutive dimension of social reality . . . not just a measure, of human activity. (2002, p. 24)

However, intersubjective time is not the inevitable result of spatial and temporal proximity between individuals. Fabian stresses, "for human communication to occur, coevalness has to be *created*. Communication is, ultimately, about creating shared Time" (2002, emphasis in original, p. 31). Writing in 1983, Fabian noted "an increased recognition of intersubjectivity in such new disciplines as ethnomethodology and the ethnography of speaking." However, the dominant model of human communication was still predicated upon the assumption of temporal distancing between participants:

> At least, I believe this is implied in the widely accepted distinctions between sender, message, and receiver. Leaving aside the problem of the message (and the code), these models project, between sender and receiver, a temporal distance (or slope). Otherwise, communication could not be conceptualized as the *transfer* of information. (Fabian, 2002, p. 31)

In his recent essay *Language and Time*, Fabian notes that his "growing awareness of our ways with time" has sustained his interest in the convergence between "pragmatically oriented approaches in linguistics and language-oriented views of anthropology" (2007, p. 33). Describing his "point of departure" as "a philosophical position that is materialist and dialectical," he realizes his interests are shared only by "those to whom relating language and time is an empirical, hence a practical, and an epistemological problem. 'Epistemological' means related to, accounting for, and justifying practices of knowledge production" (2007, p. 37). His examination of the connection between time and language is predicated upon a critique of linguistic formalism, "the kind of linguistics that requires the elimination of time." This atemporality can be traced to Saussure's absolute dichotomy between language as the system of *langue* (synchronic) and language as spoken *parole* (diachronic). However, Fabian counters by citing literary critic Jameson:

> Once you have begun by separating diachronic from synchronic . . . You can never really put them back together again. If the opposition in the long run proves to be a false or misleading one, then the only way to suppress it is by throwing the entire discussion on a higher dialectical plane. (Fabian, 2007, p. 34; quoting Jameson, 1972, p. 18)

Since language-centered research is based upon the production and analysis of textual empirical data, Fabian also examines the connections between knowledge production, the creation of shared time, and the use of texts:

> Epistemologically this means that what we have said earlier about presence must include memory in the sense that texts become evidence through being re-cognized as relevant. There are no texts "as such"; every text exists in a context of other texts and our ability to recognize such context presupposes remembrance of a past. Put more concretely: current practices of speaking or "languaging" are always rehearsals of earlier practices. (2007, p. 38)

Despite its excellent, though brief, discussions of intersubjective time, Fabian's *Time and the Other* was primarily about the allochronism of anthropological writing, about the *denial* of coevalness. Similarly, his later work contains tantalizing hints for empirical research on the interrelations between shared time, history, language and

texts, but we find only limited application. Therefore, the VMT Project can be seen as not only embracing but also advancing the research concerns of CE through fine-grained analysis of the *creation* of coevalness during interactions between members of virtual math teams.

Objectification

Returning to reflect upon the phenomenon of objectification in his 1971 essay *History, Language, and Anthropology*, Fabian in 2001 wrote: "One thing is clearer to me now than it was at the time. The decisive difference between the positivist conception of objectivity and the alternative I was struggling to formulate involved a theory of *objectification*" (2001, p. 15). In a footnote to this passage, he grapples with the concept of objectification:

> I am neither able nor willing to give this term a clear axiomatic definition. What it designates is a problem I am struggling with: the notion of objectivity as applied to knowledge of "things historical and cultural" needs to be developed in terms of a theory of *Vergegenständlichung*, that is, of the making of all those things that can become the objects of—in the case we are discussing here—ethnographic knowledge. (2001, p. 208)

Positivism, because it claimed that social scientific knowledge was based on the study of preexisting facts that could be studied like natural objects, "needed no theory of the constitution of objects." However, the language-based view of ethnographic knowledge Fabian was struggling to articulate was "based on what is intersubjectively and communicatively produced," and therefore "had to include a theory of objectification capable of specifying what in communicative interaction becomes an object and thereby the basis of objective knowledge" (2001, p. 15).

The complex and nuanced use of the term *objectification* has been taken up within the learning sciences, and specifically math education by Sfard in her theory of how math objects are constructed in math history and in math learning. According to Sfard, the process of objectification involves "two tightly related, but not inseparable discursive moves: *reification*, which consists in substituting talk about actions with talk about objects, and *alienation*, which consists in presenting phenomena in an impersonal way, as if they were occurring of themselves, without the participation of human beings" (2008, p. 44). For example, the statement "He *cannot cope* with even the simplest arithmetic problems in spite of years of instruction." might be reified as "He *has a learning disability*" (2008, p. 44). Once reified, the "alleged products of the mind's actions may undergo the final objectification by being fully dissociated, or *alienated* from the actor . . . by such discursive means as the use of the passive voice or the employment of the given noun in the role of grammatical subject." Even a simple mathematical statement like "two plus three make five" eliminates the human subject, effectively disguising "the fact that numbers are discursive constructs and, as such, are human-made rather than given" (2008, p. 50).

Sfard continues by discussing both the "gains" of objectification, particularly in mathematics discourse, and the "traps" of objectification, particularly in "discourse on thinking." Objectification increases both the communicative and practical

effectiveness of mathematical discourse. For example, it is the objectification of complex discursive sequences that allows us to see (86 + 37) and (123) as equivalent and interchangeable numerical expressions. Similarly, a symbolic expression such as (3 + 4 = 7) is actually "a shortcut for a rather lengthy story about our own discursive actions of counting. As a result of objectification, the meta-discursive nature of this proposition remains invisible." The problem occurs when "all, the objects—discursive (words, expressions) and extra-discursive (independently existing material objects)—seem to belong to the same ontological category of 'things in the world,' with their mutual relations being similarly 'objective' and mind independent." Sfard characterizes this situation as *ontological collapse*, which can result in (a) illusory dilemmas, (b) false dichotomies and/or (c) consequential omissions (2008, pp. 51-57).

The reason all of this matters is that children who are first learning about math have not yet objectified these discursive processes. They therefore have trouble, for example, seeing ten marbles and ten coins as "the same number." However, once "mathematists" begin to objectify these discursive processes, numbers become discourse-independent entities. The subsequent invisibility of the objectification process is reflected in mainstream math education, where "numbers are self-sustained entities existing in the world along with humans and animals." Piaget's "expression 'child's contact with numbers' further implies that when a child is born, the numbers are already out there in the world waiting to be discovered along with stars, trees, and other material objects" (Sfard, 2005, p. 285).

In her most recent work, Sfard offers an extended analysis of the discursive construction of math objects (2008, pp. 163-194). In Chapter 4, Stahl related Sfard's work to the issue of "deep learning" in mathematics:

> One must be able to unpack or de-construct the processes that are reified as the object. To be able to write an equation—e.g., during a test in school, where the particular equation is indicated—is not enough. One must to some extent be able to re-create or derive the equation from a concrete situation and to display alternative visual realizations, such as graphs, formulas, special cases and tables of the equation. There is not a single definition of the equation's meaning, but a network of interrelated realizations. (2008, p. 363)

Thus, deep learning in mathematics is not the acquisition of knowledge, but rather "participation in co-construction of realizations" through discursive social processes.

Fabian's ongoing struggles to link: (1) a non-empiricist conception of objectivity, (2) intersubjectivity, and (3) a theory of objectification all have deep resonances with the VMT Project. In fact, Sfard's work on the discursive construction of math objects, coupled with VMT's fine-grained analyses of math discourse represent a productive embodiment and extension of CE concerns.

Intersubjectivity

Turning to the third element of CE that is particularly relevant to the VMT Project, *intersubjectivity* involves social phenomena, which are not simply mental (individual psychological) or physical objects, but have been co-constructed by sets

of people and are shared within dyads, small groups, communities or cultures. It can briefly be characterized as:

> some set of relations, meanings, structures, practices, experiences, or phenomena evident in human life that cannot be reduced to or comprehended entirely in terms of either subjectivity (concerning psychological states of individual actors) or objectivity (concerning brute empirical facts about the objective world). (Zurn, 2008, p. 116)

We can begin our extended discussion of intersubjectivity by juxtaposing two seemingly disparate studies presented by Goodwin. The first analyzes the communication skills of an elderly man with severe aphasia (1995; 2004), while in the second study we watch as a student archaeologist learns an essential component of her craft, the delineation and documentation of soil features encountered during an excavation (Goodwin, 1994; 2000). The point in both cases is how the aphasic man's communication and the archaeologist's categorizations are intersubjectively achieved.

Chil, a close relative of Goodwin, was a 65-year-old attorney when he suffered a massive stroke in the left hemisphere of his brain that left him paralyzed on the right side of his body. The stroke also resulted in severe aphasia, an almost complete loss of the ability to produce meaningful language. At the time of Goodwin's study thirteen years after the stroke, Chil had a vocabulary consisting of only three words: *yes, no,* and *and.* However, Goodwin's video-assisted analysis revealed that the man has "a wider communicative repertoire than his limited vocabulary would indicate." While not perfect, his ability to understand what others were saying was quite good and he was able to utilize the sequential organization of conversation, his social and material environment, and the communicative resources and actions of his interlocutors to enhance his communicative abilities. He could also use gesture and prosody to display affect and project "a range of subtly differentiated stances toward talk and other events" (2004, p. 152). For example, a single *no* had a structurally different meaning than the three-unit *no, no, no,* and the prosody of a longer string could help refine its meaning.

In the episode presented, Chil is asked a question about whether he had ever been "in a big earthquake." The sequential positioning of the question and Chil's response makes this a "second story" that draws on the structure and narrative content of an earlier account. After a few incorrect attempts to interpret his gestures, Chil's wife begins an account that he shapes, elaborates, and corrects through his gestures and limited vocabulary. Goodwin stresses that this is not merely a narrative requested by Chil and then related by his wife. Although this is a "shared story," he remains the primary author. When his wife takes the narrative in a direction other that the one he intended, Chil is able to display his disagreement and redirect her telling.

Chil's use of gestures, coupled with the work performed by his interlocutors to correctly understand the gestures, is particularly intriguing. Rather than representing "a single underlying psychological process," gesture and talk are "structurally different kinds of sign systems." For fluent speakers, "talk and gesture . . . mutually inform each other and indeed are deeply parasitic on each other. Gesture achieves its

typical transparent intelligibility through the way it is embedded within a larger ecology of meaning-making practices." The "intrinsic multimodality of human language use" is typically not noticed in everyday interactions. However, in this case the mutually-informing relationship between talk and gesture is absent, necessitating "a reallocation of participant roles within this ecology of sign systems, with an interlocutor rather than the gesturer/speaker providing the language necessary to explicate the gesture" (Goodwin, 2004, p. 160). Chil's ability to shape the actions of others through gestures and other interventions requires:

> the active collaboration of others, who must engage and work with his signs in ways that extend well beyond simply decoding conventionalized meanings. Fortunately, the sequential organization of interaction provides an architecture for the accomplishment of this intersubjectivity. . . . Chil and his interlocutor can check and negotiate their provisional understandings through a collaborative process of meaning making. (Goodwin, 2004, p. 162)

Although the case of Chil, with his three-word vocabulary, would seem to be an extreme example inapplicable to the analysis of "fluent" conversation, Goodwin notes than these are differences of degree rather than kind. All conversationalists draw upon and tie into what has been said by other parties, transforming prior talk to suit their own projects, and storytelling in fluent conversation is typically a collaborative activity rather than a monologue. This is also an extreme manifestation of Vygotsky's "zone of proximal development," wherein a participant in a conversation "goes beyond his or her abilities as an individual by using resources provided by others" (2004, p. 155). The extreme nature of Chil's case gives us an enhanced appreciation of the "architecture of intersubjectivity" that characterizes all human interactions. This example challenges the view that linguistic competence is based exclusively upon psychological or neurological structures lodged within individual minds, or that conversations can be analyzed merely as exchanges between discrete individuals.

Turning to our second example, Goodwin analyses how archaeological features are delineated and documented (Goodwin, 1994) and how Munsell color charts are used to differentiate and describe soil colors (Goodwin, 2000). He examines three specific practices: *coding, highlighting,* and *producing and articulating material representations,* through which practitioners "build and contest *professional vision,* which consists of socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" (1994, p. 606).

Coding schemes are one of the systematic practices used to transform the world into categories and events that are relevant to professional practice. Specifically, the

> encounter between a coding scheme (i.e., Munsell color classification) and the world is a key locus for scientific practice, the place where the multifaceted complexity of "nature" is transformed into the phenomenal categories that make up the work environment of a scientific discipline. It is precisely here that nature is transformed into culture. (1994, p. 608)

Here, nature is *objectified*. The use of coding schemes requires active physical, perceptual and cognitive work, but also organizes and structures perception of the

world: "Insofar as the coding scheme establishes an orientation toward the world, it constitutes a structure of intentionality whose proper locus is not an isolated Cartesian mind but a much larger organizational system" (1994, p. 609).

The practice of highlighting is used in complex perceptual fields to make distinctions between figure and ground, between what is relevant and important for the purpose at hand and what can be dismissed as "noise." Goodwin's example is the delineation of post molds (features that indicate where structural posts once stood) based upon very subtle differences in soil color and texture. The ability to make these delineations is one of the most important skills a novice archaeologist needs to acquire. Borrowing a phrase from Garfinkel (1967), Goodwin describes the "documentary method of interpretation" whereby "the category 'post mold' provides a texture of intelligibility that unifies disparate patches of color into a coherent object. These patches of color in turn provide evidence for the existence in this patch of dirt of an instance of the object proposed by the category" (1994, p. 610).

Goodwin discusses the importance of graphic representations as embodied practice, using the example of a novice archaeologist (Sue) working with her professor (Ann) to draw a profile that depicts the soil layers and cultural features visible in the vertical face of an excavation. Drawing a profile is not just an isolated, individual skill: "The ability to build and interpret a material cognitive artifact, such as an archaeological map, is embedded within a web of socially articulated discourse" (1994, p. 262). Describing graphic representations as "a central locus for the analysis of professional practice," Godwin notes that they do not mirror spoken language, but rather "complement it, using the distinctive characteristics of the material world to organize phenomena in ways that spoken language cannot." Fine-grained video analysis was used to capture complex situated interactions as Ann guides Sue in the proper delineation and measurement of soil features. According to Goodwin,

> growth in intersubjectivity occurs as domains of ignorance that prevent the successful accomplishment of collaborative action are revealed and transformed into practical knowledge—a way of seeing that is sufficient to complete the job at hand—in a way that allows Sue to understand what Ann is asking her to do and make an appropriate, competent response to her request. (1994, p. 614)

However, in this situation "the relevant unit for the analysis of the intersubjectivity" is not Sue and Ann "as isolated entities," but rather

> archaeology as a profession, a community of competent practitioners, most of whom have never met each other but nonetheless expect each other to be able to see and categorize the world in ways that are relevant to the work, tools, and artifacts that constitute their profession. (1994, p. 615)

Upon reflection, we see that Goodwin's two studies are perhaps not so disparate after all. The issue of intersubjectivity was central to both cases: For Chil, contextual resources and the sequential organization of interaction provided an "architecture of intersubjectivity" that allowed his interlocutors to understand him much better than would be indicated by his extremely limited vocabulary. Although his case was extreme, it serves as a reminder that linguistic competence is never lodged merely

within the skull of a discrete individual. In the case of Sue, the student archaeologist, we saw that establishment of intersubjectivity was integral to becoming a full-fledged member of her community of practice (Lave, 1991). Finally, both case-studies drew our attention to the multi-modality of human communication. In Chil's case the mutually-informing relationship between talk and gesture was severed, forcing his interlocutors to frequently decode his gestures in the absence of complementary speech. In the training of the novice archaeologist we saw the importance of graphic representation as a mode of communication that complements, but does not mirror, speaking. In fact the ability to construct graphic representations and to coordinate between textual, graphic, and spoken modes of communication will be essential for Sue's development as an archaeologist.

Temporalizing, Objectification and Intersubjectivity in VMT

In the following subsections, we will briefly explore how the critical ethnography issues of temporalizing, objectification and intersubjectivity are manifested in the VMT Project.

Temporalizing the Problem Space

In the preceding section, we stated that Fabian advocated a "materialist and dialectical" philosophical stance to understanding the interrelations between language and time. However, he also noted that this approach would be of interest only to researchers who see this relationship as "an empirical, hence a practical, and an epistemological problem." In this context, epistemological means "accounting for, and justifying practices of knowledge production" (2007, p. 37).

In Chapter 6 of this volume, Sarmiento implicitly responds to the challenge, providing a fine-grained analysis of the practices of knowledge production employed by small groups of VMT students engaged in collaborative problem solving over multiple sessions. He is particularly interested in understanding group construction and maintenance of a joint problem space (JPS). He describes the JPS "as a metaphor for the social order that is established in small-group problem-solving interactions," and traces the development of the concept from the individualist conception of problem spaces in information-processing research to more sophisticated conceptions that capture complexities of collaborative problem solving. Within the learning sciences today, collaborative activity is often conceived as occurring within a joint problem space, where successful collaboration requires integration of "a *content space* pertaining to the problem being solved and a *relational space* pertaining to the ways that participants relate to each other." Not surprisingly, construction and maintenance of a JPS "*represents the central interactive challenge of effective collaborative knowledge building and learning.*"

Construction and maintenance of a JPS is complex enough in brief, single-episode collaborations; however, it becomes even more challenging when the collaborative

activity is dispersed over time in multiple episodes and across multiple collectivities, as is generally the case in naturalistic, "real world" settings. In this chapter Sarmiento is particularly interested in understanding how co-participants "bridge" between multiple, discontinuous collaborative episodes over time, particularly when there are changes in group composition. He found that bridging activities included: "(a) narrating or *reporting* past doings as resources for constructing a new task, (b) *remembering* collectively and (c) *managing* the history of the team." Given the importance and ubiquity of these bridging activities, it is suggested that the two-dimensional model of the JPS: (1) managing participation (relational) and (2) knowledge artifacts and actions (content) be expanded to include a third dimension: "the temporal and sequential unfolding of activity" (see Figure 6-4). The temporal and sequential dimensions of collaborative activity are particularly apparent in Log 6-2, an episode that built upon and extended a previous session, but which also included members not present in the earlier encounter. At first glance, it might appear that one group member (Meets) was solely responsible for remembering prior activities and bringing newcomers up-to-date. However, closer examination of the transcript reveals, "The activity of remembering unfolds as a collective engagement in which different team members participate." In fact, there is a fascinating segment where Meets was unable to "see" how an aspect of their earlier problem solving was accomplished, and Drago—who did not participate in the earlier episode—was able to contribute an essential element to the construction of the collective memory.

Although it was not presented in these terms, in Logs 6-1 and 6-2 we are witnessing what Fabian, in *Time and the Other*, calls the creation of *coevalness*, or "intersubjective time." Recall that for Fabian, time "is not just a measure of human activity," but rather "a constitutive dimension of social reality." However, coevalness does not just happen; shared time has to be *created*, and intersubjectivity is impossible without it. The notion of coevalness also implicitly challenges the dominant "information transfer" model of human communication, which is predicated upon the assumption of "temporal distancing" between participants and clear "distinctions between sender, message and receiver." Chapter 6 provides an analysis of the connections between knowledge production, collective memory and the production and use of texts. For Fabian, "there are no texts 'as such'; every text exists in a context of other texts and our ability to recognize such context presupposes remembrance of a past."

While *Time and the Other* was primarily about the *denial* of coevalness in classic ethnographic writing, Fabian's work also provides a framework for understanding the *creation* of intersubjectively shared time, and the VMT research provides an ideal opportunity for fine-grained understandings of how shared time is created. The work presented in Chapter 6 uncovers how intersubjective time is co-constructed as a temporal dimension of the joint problem space, i.e., the social order established by the group of students. In their bridging activities of reporting, remembering and managing their work, the virtual math team discursively constructs their past, present and future events as intersubjectively available, ordered and meaningful. It labels the events with temporal markers such as tensed verbs and it locates the events within an

indexical network of significance (see Chapter 26 also), which has a temporal dimensionality.

Objectification of Math Artifacts

We saw above Fabian struggling to formulate and articulate what he tentatively called a theory of *objectification* "capable of specifying what in communicative interaction becomes an object and thereby the basis of objective knowledge." He noted that the positivist social scientist has no need for a "theory of the constitution of objects" since knowledge is supposedly based on the study of pre-existing facts (including "social facts") that can be studied like natural objects. While not phrased in precisely these terms, Çakir's Chapter 7 reports on a fine-grained examination of processes of objectification or, in other words, the collaborative construction of math objects by VMT students. Çakir analyzes how three non-co-located middle-school students construct and coordinate whiteboard inscriptions, chat postings, mathematical expressions and other elements of virtual math team activities.

As previously noted, Sfard (2008) discusses the "gains" and "traps" of objectification, noting that all math objects—from basic numbers up through advanced theorems and proofs—are objectifications of complex discursive processes. This objectification process provides an essential foundation for all mathematical discourse. The problem, however, is that once objectification occurs, the socially constructed nature of the math object can become invisible to mathematists and analysts alike. This invisibility is reflected, for example in mainstream math education's tacit assumption that "numbers are already out there in the world waiting to be discovered [by the young child] along with stars, trees and other material objects." Although the social construction of math objects is a theme that can be found throughout this volume, Chapter 7 provides a particularly compelling analysis of the complexly "sedimented" nature of these semiotic objects (see also Chapter 3). In the extended example we see the three students constructing and narrating a complex math object that they eventually refer to as a *hexagonal array* while they work to define and solve their own math problem (see especially Log 7-3 and Figures 7-6 and 7-7). Çakir's analysis carefully avoids a literal, empiricist understanding of math object, noting that the students' term "hexagonal array does not simply refer to a readily available whiteboard illustration. Instead it is used as a *gloss* to talk about an imagined pattern that grows infinitely and takes the shape illustrated on the whiteboard only at a particular stage."

Çakir's analysis also focuses on the different affordances of the two interaction spaces (text chat and whiteboard), showing how the students coordinate these two modes of communication. For example, in Figure 7-7 we see Jason coordinating between text chat and the whiteboard illustration, using the referencing tool to link a specific chat posting with a highlighted segment of the hexagonal array. In this illustration, we see the result of a sequence of at least three separate actions: posting the chat text, highlighting a portion of the array and using the arrow to link the two items. Çakir notes the complexity of coordination between the two interaction spaces: "a participant cannot narrate his/her whiteboard actions with simultaneous

chat postings as can be done with talk in a face-to-face setting." This observation recalls Goodwin's analysis of the aphasic communication skills of Chil. Goodwin noted that talk and gesture do not represent "a single underlying psychological process," but are, rather, "structurally different kinds of sign systems." Nevertheless, the "intrinsic multimodality of human language use" is typically not noticed in everyday interactions. In Chil's case, however, "the mutually-informing relationship between talk and gesture is absent," and his interlocutors must work collaboratively with Chil, and with each other, to make out his meaning. This is possible only because the "sequential organization of interaction provides an architecture for the accomplishment of this intersubjectivity."

As it happens, the unfamiliar nature of the VMT dual interaction spaces (text and graphics) helps us notice structurally different kinds of sign systems and understand how the students use the sequential organization of interaction as a sense-making resource. In this exotic virtual world, where the normal methods of coordinating gesture and talk are not available, people can be seen to be collaboratively employing innovative methods to create objects and discuss them. Chapter 7 is able to follow in detail the processes by which the group of budding mathematicists objectifies the math object, *hexagonal array*. In this analysis, we see that the object is, in fact, quite different from physical objects in the world. It incorporates the lessons of visual reasoning with illustrative diagrams, narrative reasoning that follows the growth of hexagonal line patterns and symbolic reasoning that captures relationships in symbolic equations. The rich phenomena that the students explored and shared are encapsulated and sedimented in the term *hexagon* and the corresponding equation. While this objectification provides a convenient gloss for their discourse, it also alienates the original experiences, making it difficult for newcomers to appreciate the mathematical understanding incorporated in the new math object.

Intersubjectivity of Questioning

A fundamental, if implicit, theme that unites CE is the issue of how (or even, if) genuinely intersubjective understandings can be accomplished across barriers of difference, particularly power differences. However, all human interactions are characterized by some form of difference, which may or may not be made relevant during the course of an interaction. This is particularly true in teaching/learning and apprenticeship contexts, which, by definition, are predicated upon differential skill and knowledge. In a compilation of ethnographic studies that included examinations of apprenticeship among Mayan midwives, Liberian tailors, US navy quartermasters, US butchers, and "non-drinking alcoholics," Lave & Wenger (1991) began to challenge metaphors of "knowledge acquisition" and "knowledge transfer" with a model of "learning-as-participation" (see also Sfard, 2008, pp. 76-80). In this model, beginning practitioners learn by participating in existing communities of practice. In the beginning, the novice's participation will be quite peripheral to the activities of the community, but will become less peripheral over time. Because the apprentice's activities are sanctioned by the community, Lave & Wenger characterize this model

of learning as "legitimate peripheral participation." We saw a nice example in the collaborative work of Sue, the student archaeologist, and her professor, Ann. Goodwin noted that "growth in intersubjectivity occurs as domains of ignorance that prevent the successful accomplishment of collaborative action [in this case, drawing an archaeological unit profile] are revealed and transformed into practical knowledge." Goodwin also noted that, ultimately, "the relevant unit for the analysis of the intersubjectivity" in this example is not Sue and Ann "as isolated entities," but rather "archaeology as a profession, a community of competent practitioners."

While the participationist model of learning is compelling, it is yet to be seen how this is accomplished at the small-group level of interaction. In Chapter 8, Zhou examines interactionally delicate situations where group participants are purportedly peers (at least in age and school level) but there are marked differences in competences relevant to their task. Her interest is in understanding how (or if) these disparities in competence are made relevant, negotiated, and addressed. In her first example, Nish joins as the interaction is well underway. He presents a self-oriented report indicating a lack of understanding about what is happening (Log 8-1). Because Nish's report came at an interactionally awkward moment (as group members were engaged in an unrelated task) and because Nish gave dis-preferred responses indicating that he found answers to his initial query inadequate, all group members were forced to do additional interactional work. In Logs 8-3 and 8-4, we see what Zhou calls "situated expertise" as other group members work collaboratively to address Nish's questions. In Log 8-4 line 146, Nish is presented with a formula as part of the response to his continuing queries. Zhou notes:

> In their response to Nish's question, the three participants treat the formula $n(n+1)/2$ as something already existing that has been "*incorporated*" (in Jason's words) into the construction of their problem solution. By offering this as established knowledge, they assume this knowledge is available and accessible to all, including the questioner.

Although it is not presented in these terms, it is clear that, for the original three participants, the formula is an objectification of earlier discursive "realizations" (Sfard, 2008, see also Chapter 3, above) (presumably in their math classrooms), so it can be presented as a self-evident, pre-existing "thing" rather than as a result of earlier work. For Nish, who had not experienced this formula in class, the formula is certainly not a self-explanatory math object.

In her last example (Logs 8-8 and 8-9), Zhou presents an example where a new member, Qwer, joins the same group and asks a similar question. However, in this instance, the newcomer was able to phrase his question in a manner that displayed his general math competency, thereby demonstrating the legitimacy of his/her participation, no matter how peripheral.

The analysis of Chapter 8 shows that a question is not a simple expression of an individual's mental contents, but is co-constructed in the group discourse as an intersubjectively significant action. The statement of the question may be stretched across several minutes and many chat postings. The initial postings of Nish and Qwer were only opening bids to develop something that could be developed into a

question, could be intersubjectively understood and accepted as a question within the context of the group discourse and could elicit an appropriate and adequate answer. The initial bid could easily fail and be ignored, misunderstood or rejected. It only becomes a meaningful activity in terms of how it is taken up by the group, developed, framed, discussed and answered. As Chapter 8 shows, the intersubjective process of asking a question is not a simple comparison of pre-existing mental models of some matter to establish "common ground" through agreement of individual opinions (Clark & Brennan, 1991), but involves a co-construction within the group's discourse, work situation, interpersonal relations, history and indexical network. Successful questioning in a virtual math team illustrates the establishment of intersubjectivity.

VMT as a CE Approach to CSCL

Although not initially framed as a traditional ethnographic research project, the VMT Project has its ethnographic influences. One of the three principal investigators of the project, Shumar, is an anthropologist and has co-contributed Chapter11, which takes an ethnographic view of agency and frames it in sociological terms. In addition, the project's design-based approach to research is inherently ethnographic. Also, the VMT team has been influenced by anthropologists who are important within CSCL, HCI and the learning sciences (e.g., Suchman, Lave, Nardi). As we have seen, VMT certainly exemplifies a critical ethnographic approach to CSCL and, in turn, also has the potential to address and advance many aspects of the CE research agenda.

From our comparisons between "classic" and "critical" ethnography we see profound transformations in ethnographic research and writing, transformations that resonate quite strongly with the VMT Project. First generation CE emerged primarily from continental critical theory, particularly social constructivism and Habermas' critique of scientism. However, first generation critical ethnographers (particularly Fabian and Scholte) also agreed with Habermas' realization that scientism could not be challenged merely through philosophical and theoretical disputation, but must be confronted through anthropological praxis that "transcends its own boundaries."

With the onset of second generation CE, Fabian could celebrate the hard-fought victory resulting from the "critique of misplaced scientism in anthropology," noting that this critique had been implicitly incorporated into second-generation CE. With its primary emphasis on group cognition and intersubjective understanding, VMT also embodies a profound, if implicit, critique of scientism in social research. However, the victory celebrated by Fabian was certainly not final or ubiquitous. In particular, the push for "science-based" educational research represents what Maxwell calls "reemergent scientism" (2004a; 2004b).

Fabian (1990a) embodied his interest in taking critical anthropology to a new level by making an important distinction between "informing" and "performing" models of ethnographic knowledge. Rather than eliciting "information" by interrogating ethnographic "informants," Fabian played the role of

"ethnodramaturge," the provider of occasions for performances through which cultural knowledge could be interactively created and expressed. He also departed from standard ethnographic practice by presenting detailed transcripts of the events upon which his analysis was based. It might seem like a bit of a stretch to characterize the moderator of a VMT chat session as an ethnodramaturge, but this research proceeds not by surveying or interviewing middle-school students for retrospective accounts of their collaborative cognitive processes, but by setting the stage for collaborative performances by young mathematists—staying out of the way as much as possible, and meticulously recording and analyzing the results. In accordance with Fabian's CE approach, these recorded interactions "are not just contingent indicators of an underlying necessary reality" but rather embody the *results of a process* in which a totality realizes itself" The VMT data sets are also archived in a form that will allow subsequent researchers to do their own analyses.

For readers accustomed to the classic image of the lone ethnographer who sets off for the most remote, bounded and "untouched" locale available to conduct detached, "objective" social scientific research, VMT will seem like a very non-ethnographic project indeed. However, as we have seen, the successive generations of CE have profoundly transformed ethnographic practice and writing. Rather than affecting a pose of detached neutrality and non-intervention, VMT research can be characterized as "design-based research" (Barab & Squire, 2004) or perhaps "critical design ethnography" (Barab et al., 2004), where the ongoing actions and interventions of the researchers become part of the research process. Several researchers represented in this volume have presented their work as "micro-ethnography." While classic ethnography's aspiration to "holism" dictated a preference for isolated, bounded field sites where all aspects of a culture (e.g., ritual, subsistence, kinship) could be analyzed and integrated, micro-ethnography represents a very different conception of holism, one "that captures the interactional and discursive constitution of human relations" without abstracting "interaction from its material foundations and historical contexts," providing "an encompassing and complex understanding of what Lukacs (1971) called the 'totality' of social facts" (Streeck & Mehus, 2005, p. 399). Although we do not find prominent explicit linkages between the two research traditions, this characterization of the VMT Project resonates very nicely with the image of CE we have developed here.

Recall that Bader & Nyce (1998) offered a rather pessimistic assessment of the value placed on ethnographic research: "The difficulty is that knowledge about the social construction of reality is not the kind of knowledge the development community values, can do much with, or seems to be much interested in." However, as we have seen, this is precisely the type of knowledge the VMT team—as the software developers of an online math discourse environment—values, knows what to do with, and is, indeed, very interested in.

As design-based research, the VMT Project explicitly aims to study the (critical) "conditions of the possibility" (see Chapter 26) of a form of learning that does not yet exist, but that could emerge based on existing technological and social conditions. It is significant that the Director of the VMT Project studied critical theory for three years in Heidelberg and Frankfurt during the late 60s and early 70s

and took courses from Fabian at Northwestern University during the early 70s. His philosophy dissertation and writings from that period tried to synthesize in a mutually critical manner the social theory of Marx and Adorno with the anti-positivist philosophy of Heidegger (see Stahl, 1975a; 1975b; 1976). In his subsequent AI dissertation, he applied this perspective to software design methodology (Stahl, 1993). The current volume—particularly in the concluding Chapter 28—envisions a critical science of group cognition that overcomes reductionist influences in CSCL research that he has critiqued at least since (Stahl, 2002). The VMT Project—with its focus on group cognition—has deep roots in critical ethnography and its philosophical influences, as well as in the more apparent post-cognitivist traditions like ethnomethodology, distributed cognition, activity theory, situated theory, actor-network theory and phenomenology.

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